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A Vision for Rapid Transit in San Francisco

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San Francisco Municipal Railway

The Municipal Railway is poised to play an increasingly important role as San Francisco moves into the 21st century. We are committed to creating a rapid transit system that we can be proud of, and it starts with this vision.

Michael T. Burns

Michael T. Burns, General Manager

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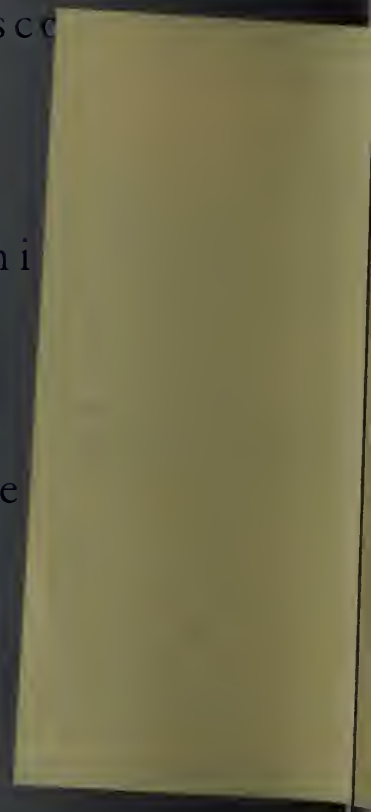

Michael T. Burns, General Manager

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OUR VISION

The San Francisco Municipal Railway (Muni) has been serving the city for 90 years and contributes to the city's unique character that is the pride of its residents. San Franciscans depend on Muni to take them to work, school, church, museums, even the Marin Headlands. Over 750,000 riders use Muni each weekday, adding up to 235 million passenger trips a year. Without Muni, getting around in the city would be slower, more difficult and aggravating, and for some, even impossible.

Muni is the largest transit operator in the Bay Area, and the seventh largest operator in the United States based on total ridership. Unlike most other large transit operators, however, Muni moves the bulk of its riders on vehicles operating in mixed traffic on city streets. As general traffic and congestion increase, vehicles operating in mixed traffic provide a less satisfactory way to travel around San Francisco. As congestion increases and trips on buses and streetcars get slower, Muni must find a better way of moving people through San Francisco.

Muni must find better ways of moving people through San Francisco.

While Muni strives to serve the city efficiently and comprehensively, there is room for improvement. Muni's buses and trains are sometimes crowded far beyond capacity; riders experience delays and travel is not as reliable as it could be. It can take over an hour to reach downtown from some parts of the city. Riders, discouraged by the prospect of taking public transit, sometimes turn to their cars – a choice that increases congestion, takes up land for parking, and pollutes the environment. This in turn exacerbates Muni's concern not only because of congestion in the streets but because more and more of the city's resources, land and energies are directed to private automobiles at the expense of public transit.

Getting people out of cars and on to public transit is the most efficient way to move people, use public streets, improve air quality and in the long run, expend valuable and limited resources. The economic cost of operating a private automobile during peak hours – including external subsidies, pollution, and time – is twice as high as for a bus or streetcar (Litman, Transportation Cost Analysis, 1999).

This has spurred Muni to envision what a truly first-class transit system for San Francisco might look like. It would be one that moves our riders quickly and efficiently throughout the city with a minimum of waiting. It would be a high-capacity, easily accessible, rapid transit style service. It would enable riders to transfer easily between Muni lines as well as to BART, Caltrain, ferries, and other interregional transit services.

This enhanced and expanded system would attract more people to public transit, taking cars off the road and freeing up street space for those necessary auto trips. It would help implement San Francisco's

Transit First policy, which is rooted in the City Charter. That policy states,

> *Transit priority improvements, such as designated transit lanes and streets and improved signalization, shall be made to expedite the movement of public transit vehicles. New transportation investment should be allocated to meet the demand for public transit generated by new public and private commercial and residential developments.*

The purpose of this document is to propose a vision for moving people in San Francisco along 12 major corridors in a rapid transit mode. In this vision, transit vehicles would be largely separated from general traffic, and trips could be made more quickly in the corridors. The heaviest corridors could ultimately be constructed as rail corridors – some on the surface in exclusive lanes, and some in a subway. Given funding constraints, not every corridor could be constructed as a rail corridor immediately, so this vision includes incremental steps. Some interim measures include creating new Bus Rapid Transit lines and improving Transit Preferential Streets treatments, to give true priority to transit vehicles in the major corridors. The proposed improvements thus establish the basis for seeking funds for implementation.

It is important to acknowledge that some of the improvements suggested in this vision may require major changes to city streets. While those improvements are not identified here, they will be a necessary component of a comprehensive rapid transit strategy.

The purpose of this document is to propose a vision for moving people in San Francisco along 12 major corridors in a rapid transit mode

Equally important is the fact that this document describes a vision, and is not a plan. Muni will now begin to incorporate this vision into its Short-Range Transit Plan, which serves as one of the inputs to the San Francisco Countywide Transportation Plan, prepared by the San Francisco County Transportation Authority (SFCTA). As it is developed, the Countywide Transportation Plan will consider multi-modal improvements to the city's transportation system and will prioritize improvements according to specified criteria and funding availability.

This document will serve as a blueprint for moving toward that vision.

CONTEXT

SAN FRANCISCO & THE BAY AREA

San Francisco is one of the most densely populated cities in the United States, in both residential and commercial density. Approximately 799,000 people live in San Francisco today, the highest the city's population has been since the 1950 Census, when there were 775,400 people in the city. It has also gained many jobs after a dip in the early 1990s, and despite the recent slowdown in the technology sector, San Francisco is still a desirable place for employment. San Francisco is the headquarters city for a number of major corporations, and many others maintain a significant presence here. San Francisco's daytime population, including workers and visitors, is estimated at 1.1 million people.

San Francisco's daytime population is estimated at 1.1 million.

Many large projects are currently under construction in the city, including the first phase of Mission Bay – a UCSF medical research building, housing, retail and offices. A new 675,000 square foot Federal Office Building will break ground soon. The Ferry Building is under renovation, negotiations have begun for a major project on Piers 30-32, and the Port of San Francisco recently released an RFP for development on Pier 70.

San Francisco is in the process of revitalizing the Transbay Terminal, a major regional transportation facility, serving as a hub for AC Transit, Golden Gate Transit, Muni, Greyhound, and other operators. The new terminal is envisioned as a state-of-the-art multi-modal facility, bringing together bus and rail services (Caltrain and possibly a rail connection to the East Bay and high speed rail) in one terminal, along with significant commercial development and public amenities. Significant new development is already occurring around the site of the current Transbay Terminal in anticipation of the new terminal. The next step is to secure the funding, estimated at approximately $900 million. Revenues from adjacent land development are expected to contribute significantly to this funding. The San Francisco Redevelopment Agency (SFRA) has established a Transbay Study Area, including Rincon Hill to the south, to analyze this possibility.

SFRA is also working with the community to establish a redevelopment area in Bayview Hunters Point. The Hunters Point Naval Shipyard (HPNS) is poised for development and could become a major new destination in the city. Preliminary plans for HPNS over the first ten years of the project focus on industrial, research and development, and cultural and educational development. Housing makes up a small portion of the project. This would make the Shipyard a major employment center requiring improved service by public transit.

The Planning Department, taking a long-range view, initiated the Better Neighborhoods 2002 program, a series of specific plans for neighborhoods in the city that have good transit service - Balboa

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Park, Central Waterfront, and Market/Octavia. The plans, with much input from local residents, could result in denser housing in these areas to take advantage of the transit infrastructure. The next "better neighborhood" is likely to be along the Geary corridor.

Many residential buildings have been completed recently, and others are in the planning stages. High-rise residential projects are opening in the South of Market (SOMA) area, and Third Street is lined with a number of new loft apartment buildings. Residential infill development continues in the Mission, Richmond, Sunset, and other neighborhoods.

The Association of Bay Area Governments (ABAG) projects that San Francisco will grow at a slower pace than the region, which is projected to grow 16%, from 6.9 million to 8.0 million, by 2020. In the following 20 years, the population is expected to grow another 19%, to 9.5 million. At the same time, the populations in the counties surrounding the Bay Area (such as Lake, San Joaquin, and Stanislaus) are expected to see triple-digit growth, suggesting growth in the number of trips around the Bay Area. It is important to note that while ABAG makes reasonable assumptions about local regulations and economic vitality, those variables are likely to change over time.

ABAG projects job growth in San Francisco as well as surrounding cities. San Francisco is expected to gain 102,800 jobs, for a total of about 731,000 in 2020. The draft Regional Transportation Plan (RTP), developed by the Metropolitan Transportation Commission (MTC), points out that this is the largest number of new jobs projected in any one city. However, the aggregate of Santa Clara cities will have more total jobs (1.3 million). In addition, employment in Dublin, Fremont and Antioch is expected grow by 50%.

This diffusion of jobs and housing across the region suggests that longer work trips between San Francisco and other cities will become more common, and that more San Franciscans will work outside the city. This will have a big impact on regional corridors, many of which are already at or near capacity. Congestion on freeways and arterials will increase significantly over the next 25 years; while 5% of roadway facilities were beyond capacity in 1998, triple that number are expected to be so in 2025.

Daily Trips in & out of San Francisco

	1998	*2025*	*Change*
SF to Peninsula	660,000	800,000	+21.2%
Bay Bridge	540,000	769,000	+42.5%
Golden Gate Bridge	170,000	215,000	+26.5%

CONTEXT

TRANSIT & TRANSPORTATION

San Francisco has a good transit system – most residential locations in the city are within a quarter-mile of a transit stop, and service is relatively frequent. The Surface Transportation Policy Project (STPP) found that in 1999, the San Francisco-Oakland area provided 3.92 hourly miles of transit service per 1,000 people, more than Chicago (2.80) and Boston (3.21). However, the percentage of commuters using transit is roughly the same (14.8%, 16.4%, and 15.2%, respectively). Thirty-one percent of San Francisco residents commute by transit, as opposed to 10% in the nine Bay Area counties (RIDES Commute Survey, 2001).

MTC data shows that San Francisco has the lowest rate of car ownership in the Bay Area (0.54 per capita, compared with .75 in the region) and the lowest vehicle miles traveled (9.8 per person, 18.8 regionwide). All of this points to a demand for transit in San Francisco that is higher than anywhere else in the region, and thus a need to make transit work better here.

Muni currently operates 80 lines in regular weekday service using four modes of vehicles: motor coach, electric trolley coach, light rail (Muni Metro and historic streetcars), and cable cars. BART and Caltrain also operate service in the city, providing regional service and limited local stops. In addition, Muni connects with AC Transit, Golden Gate Transit, SamTrans, and ferries.

During peak hours, Muni's radial routes (to downtown) operate at least every ten minutes, many of them every six minutes. Crosstown routes run at least every 15 minutes all day, and neighborhood feeder routes run every 20 minutes during peak hours.

In 1998, the N-Judah began operation on the Muni Metro Extension (MMX), serving the South Beach neighborhood, new Giants ballpark, and Caltrain terminal. Recently, Muni extended the very popular F-Market historic streetcar line to Fisherman's Wharf. Muni instituted a number of service changes in SOMA in February 2001 to better serve this rapidly changing neighborhood.

Muni's most prominent project today is the construction of the Third Street Light Rail Line. The Initial Operating Segment (IOS), scheduled to begin revenue service in 2004, will extend light rail service south from its current terminal at Fourth and King, along Third Street and Bayshore Boulevard, to a multi-modal terminal near the Bayshore Caltrain Station in Visitacion Valley. Tracks will be primarily in an exclusive right-of-way in the center of the street to improve safety and reliability, and 19 stations will be provided. A new Metro East facility will be built at 25th and Illinois Streets to store, maintain and dispatch light rail vehicles.

Muni and the city are actively pursuing funding for the Central Subway (Phase 2 of the Third Street Light Rail Line), which will extend light rail service north from King Street along Third, Geary and Stockton to Stockton and Clay, serving the Moscone Center, Union Square, and Chinatown.

Many regional transit and transportation projects are also underway or in planning. BART is working with Santa Clara County on an extension to San Jose. MTC is studying a possible new rail link across the Bay and testing an automated fare system for use on all of the region's transit systems.

BART is scheduled to open its four-station extension to San Francisco International Airport (SFO) in 2002. The extension will include a cross-platform transfer to Caltrain at Millbrae. This will bring significant numbers of riders to BART and Caltrain; BART expects nearly 70,000 trips on the extension by 2010.

Caltrain's Joint Powers Board (JPB) approved a program in 1998 for enhancements and capacity improvements including vehicular and pedestrian grade separations, new stations, and station consolidations. The JPB is also embarking on three major projects: electrification, the San Francisco Downtown Extension to the new Transbay Terminal, and Dumbarton service extension to the East Bay.

Transit serves many intercounty trips today. According to BART, 20% of its riders in the morning peak use transit to get to BART and of these, 48% are on Muni. This means that 10% of BART's morning riders are San Franciscans who took Muni to get to BART (BART Station Profile Study, 1998).

A brief survey in September 2000 found that 2,625 Caltrain riders transferred to Muni in the morning, and another 1,110 people transferred from Muni to Caltrain. This is a 37.8% increase in transfers from 1998. A separate survey in February 2001 showed that an average of 3,715 people disembarked at Fourth and King in the morning – the two surveys combined suggest that approximately 70% of Caltrain riders use Muni to reach their final destination from Fourth and King.

Muni patrons have noticed that the system is improving, and customer satisfaction is increasing.

These regional transit numbers, combined with the city and regional trends, mean that Muni must improve connections to regional transit. San Francisco residents who commute to jobs outside of San Francisco using BART, Caltrain, or buses from the Transbay Terminal cannot all park or be dropped off at the San Francisco stations. The impact of the additional auto trips would be too high. Similarly, commuters into the city must be able to reach their destinations easily via transit once they arrive in the city. This means increasing service on Muni routes that link with BART or Caltrain, and improving bus service from the stations in terms of destinations and frequency.

Muni patrons have noticed that the system is improving, and customer satisfaction is increasing. Although transit ridership is growing steadily, transit's share of commute trips has decreased somewhat since 1996 because it takes more time than other modes (RIDES Survey). There is clearly an opportunity to get more people on transit: 38% of commuters who do not currently take transit nevertheless would consider it if the system became faster and more reliable.

Muni is responding to these needs in the city and the region with this vision for system enhancement and expansion.

APPROACH

PRINCIPLES

Proposition E, approved by voters in 1999, changed Muni's governing structure and implemented service standards that were intended to advance Muni's operating efficiency and effectiveness. The next step toward achieving the vision embodied in Proposition E is to develop and fund a long-range capital plan that details Muni's service requirements over a 20-year time period and the transit improvements needed to satisfy those requirements.

In formulating this vision, Muni staff invited major stakeholders to provide input on the approach that staff should take. The stakeholders included transit advocates, the SFCTA, other city agencies, business interests, and representatives from other operators such as BART and Caltrain. Staff held a workshop for these stakeholders on March 1, 2001, where they helped shape a set of guiding principles and identified major corridors as candidates for service improvements.

The next step toward achieving the vision embodied in Proposition E is to develop and fund a long-range capital plan.

Muni's transit system must change and grow to meet existing conditions as well as projected changes in demographics and travel patterns, but must do this in a way that maximizes benefits for the riders and the system. Because this is a long range vision, it would be premature to prescribe specific projects. Instead, Muni staff has worked with stakeholders to develop a set of guiding principles to direct Muni's system growth over time.

As decisions are made about the types and locations of resource investment, these principles will help prioritize competing interests.

Integrate local and regional transit into a seamless transit network.

A seamless transit network minimizes transfer wait times and coordinates scheduling with non-Muni transit providers. Because jobs and housing will become more and more dispersed around the region, more San Franciscans will work outside the city and require connections to regional transit such as BART and Caltrain. The overall trip will be longer, so it is even more critical that the local segment of the trip be fast and reliable.

Physically separate transit service from automobile traffic on major corridors by creating exclusive rights-of-way (ROW).

Traffic congestion is a major source of delay for Muni vehicles, resulting in increased travel time and decreased reliability. Transit-only diamond lanes are often blocked by private automobiles turning right or double-parked, and are not effective without constant enforcement. A physically separated right-of-way is more effective at protecting transit vehicles from congestion and allowing them to stay on schedule. This means that street space must be dedicated to transit use, and not shared with automobiles.

Provide high capacity, rapid transit-style service in major corridors.

There are a number of major corridors in San Francisco that have high volumes of riders and suffer from chronic capacity and reliability problems. These issues, combined with the high levels of ridership, justify a greater investment in these corridors to establish high capacity rapid transit. This could be rail or rubber-tired transit in an exclusive right-of-way, surface or subway, with faster boarding and wider station spacing.

Upgrade transit service in increments as ridership builds and as funding becomes available.

Because funding is limited and proposed projects cannot all be built at once, it is important to take incremental steps so that multiple corridors can be improved simultaneously. For example, building exclusive ROW for Bus Rapid Transit (BRT, described below) can be a first step, with light rail replacing BRT as more funds become available.

There are a number of major corridors in San Francisco that have high volumes of riders and suffer from chronic capacity and reliability

APPROACH

TOOLBOX

This document outlines Muni's vision for each of the corridors – for example, light rail lines serving the length of Geary and Van Ness Avenue. However, it is clear that these improvements will require extensive planning and lead time to fully define the projects and develop a funding strategy. By necessity, only one major project can be contemplated at a time. Therefore a strategy is necessary for making incremental improvements on multiple corridors.

The aim is to make improvements in all corridors to bring each one up to a minimum level of service.

Muni has developed a toolbox of improvements that can be implemented with varying amounts of funding. Tools range from relatively low-cost Transit Preferential Streets (TPS) improvements to light rail in a subway right-of-way. The toolbox allows for a multi-phase approach with appropriate improvements in each corridor.

Each of the tools is described on the following pages. Costs are expressed as general per-mile estimates. In addition, some projects depend on completion of companion projects that would increase costs, such as new storage and maintenance facilities, new vehicles, or ongoing operating and maintenance costs. Detailed cost estimates must be made on a project-by-project basis as they move toward implementation.

Not all tools are appropriate for every corridor; conditions need to justify making the investment in that location. For instance, building a subway along a corridor with low ridership does not make sense. All corridors need basic improvements such as TPS treatments, but some conditions justify a more robust, higher capacity mode. Travel time along a corridor is one important threshold. If it rises above a reasonable amount, it becomes a factor in riders' decisions to take transit, and a more intense mode of transit is called for. Other thresholds are total ridership and potential ridership, determined by population density and land uses along the corridor, other transit options, and forecasted growth.

Some measures can be taken in a more immediate time frame. Some examples include effective enforcement of existing transit lanes and parking and turning regulations, wider application of real-time passenger information systems, and implementation of appropriate elements of the TPS package.

This document focuses on physical infrastructure investments but there are other tools that would help reduce travel time and provide a higher level of service to riders.

- Proof of Payment (POP), is already in place in the Metro system. POP permits passengers to purchase fares prior to boarding, thus expediting passenger boarding and reducing dwell time. Passengers are required to have in their possession a ticket, transfer or transit pass. Fare inspectors can request proof of payment, and passengers without it are subject to a fine.

- Express or skip-stop service reduces travel times for riders traveling long distances.

- Low-floor vehicles reduce dwell time at stops and provide easier access.

- Real-time passenger information systems tell waiting passengers when the next vehicle is expected to arrive.

Transit Preferential Streets (TPS) Treatments

This tool consists of a variety of low-to-medium cost treatments to speed transit vehicle flow. These can be implemented individually but are more effective taken together.

Signal Timing for Transit Vehicle Flow: Coordinating traffic signals along a corridor can reduce travel time by allowing transit vehicles to move quickly, without stopping and starting at each signal.

Signal Priority Systems: On-board and wayside signals detect transit vehicles approaching an intersection and give them signal preference by preempting the normal signal cycle to extend the green light. Remote systems allow preempting of signals to keep buses on schedule.

Bus Bulbs: The sidewalk is extended to the traffic lane, allowing buses to pull up alongside boarding areas. This minimizes delays since buses do not have to merge into traffic, and enhances safety and accessibility by ensuring that parked cars or other obstacles do not block buses.

Boarding Islands: These are boarding areas built on islands in the street. Like bus bulbs, boarding islands prevent the need for merging in and out of traffic. They also allow for easier turning, especially if a bus must turn left immediately after a stop.

Transit Lanes: Lanes are dedicated to transit vehicles, currently marked by solid white lines and a diamond symbol. Muni staff is researching textured or colored paving materials and new symbols to make transit lanes more visible and effective.

Exclusive Transit Right-of-Way (ROW): Transit lanes are separated from regular traffic flow by a physical barrier, such as a curb, to ensure that other vehicles cannot travel in the same lane. Cross-traffic is allowed and transit vehicles are subject to traffic signals.

Transit Stop Respacing and Relocation: Wider stop spacing allows transit vehicles to make fewer stops on a route, reducing overall travel time.

Cost per mile: $200,000

TOOLBOX

Conversion to Trolley Coach/Trolley Coach Extension

Electric trolley coaches are rubber-tired vehicles that are powered by electricity collected from fixed overhead wires. Trolley coaches now generally operate in mixed traffic, but can operate in an exclusive ROW with signal priority, or in a subway. Trolley coaches produce zero emissions and are particularly effective on steep grades.

Currently, 34% of Muni's revenue hours are operated by trolley coach. Conversion to trolley coach operation is desirable in more locations systemwide because trolley coaches are quiet, clean vehicles that enhance the quality of life in an urban setting. Limited and Express service would remain operated by diesel coaches so they can pass vehicles on wire.

Cost per mile: $6.6 million

Bus Rapid Transit (BRT)

BRT is a rubber-tired vehicle operation that is configured to offer speeds and capacity similar to rail transit, with exclusive travel lanes, limited stops, and signal pre-emption. Other characteristics include the use of low-floor transit vehicles, a prepaid fare system that expedites boarding, and stations that provide shelter and passenger information.

Because transit vehicles are separated from other vehicles and stop less frequently, travel time decreases. BRT is appropriate in corridors with high ridership where there is sufficient ROW to provide dedicated lanes. BRT does not require as much capital infrastructure as LRT, and may serve as the first phase of implementing light rail transit

Cost per mile: $28 million

This is one example of BRT operation in Quito, with exclusive lanes for buses in the center of the street. Photo courtesy of Mark Walker.

Surface Light Rail Transit (LRT)

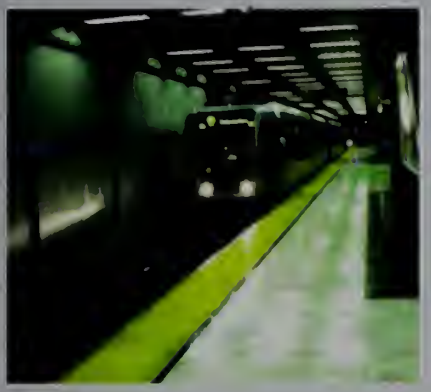
Light Rail Transit is a cost-effective rail mode powered by electricity from overhead wires, producing zero emissions. LRT on surface streets operates most effectively in exclusive rights-of-way, where traffic is prohibited (possibly by a physical barrier) from traveling in the same lane as the transit vehicle but is allowed to cross the tracks. LRT ideally operates with signal preempts, allowing it to travel relatively unimpeded from station to station. Exclusive rights-of-way may be located along the curb or down the center of the street. Where space is limited or other conditions require, surface LRT may operate in mixed flow. The majority of Muni's LRT system runs on the surface, some of it in exclusive ROW, such as the N-Judah on The Embarcadero and parts of Judah Street.

Cost per mile: $58.7 million

Subway Light Rail Transit (LRT)

In addition to running in surface operations, light rail can operate in subways in congested areas. LRT operation is most efficient in an exclusive right-of-way with no conflicts with other vehicles and pedestrians, where speed is maximized and train control can be automated. This is only possible in a grade-separated right-of-way, such as a subway. The Muni system has three subways: Market Street, Twin Peaks, and Sunset Tunnel. Muni currently operates five light rail lines with one- or two-car trains, but capacity can be increased to some extent at marginal cost by adding more cars to each train. Although subway is the most efficient environment for light rail, it also has the highest capital costs. Conceptually, a subway, once built, can accommodate electric trolley as well as light rail. The cost of building a subway is justified where there is a high density of population, destinations, and traffic, such as downtown.

Cost per mile: $365.4 million



C O R R I D O R S

With principles as the "how" and the toolbox as "what," staff developed a list of corridors for the "where." The major corridors in San Francisco are paths of travel which have high volumes of riders, serve major destinations and neighborhoods, and are anticipated to see some growth in ridership. Some of these are currently served by rail, others by motor coach or trolley coach.

The principles and toolbox are applied to each corridor to create the rapid transit vision for San Francisco.

The list begins with corridors identified in the SFCTA'S 1995 Four Corridors Plan: Third Street, Geary, Van Ness, and Chinatown-North Beach. Muni completed a corridor study on Geary in 1995 and is moving forward with implementation of LRT in the Third Street corridor.

Stakeholders at the March 2001 workshop expanded the list of corridors to include those with heavy ridership and operational issues (Market Street, Fillmore-16th Street, Potrero-San Bruno). The stakeholders identified others that balance geographic coverage across the city (Geneva-Ocean, 19th Avenue-Park Presidio), and others in which significant ridership growth is expected (Embarcadero, Hunters Point, SOMA). The workshop also addressed the need to make improvements in corridors with existing rail to provide more rapid-transit style service.

The following is a description of the existing conditions and issues in each corridor, the ultimate vision and a list of potential intermediate projects with rough cost estimates.

THIRD STREET - CHINATOWN

This is the first of the Four Corridors identified in the 1995 SFCTA plan to be constructed. The cost of the IOS and Central Subway combined is $1.3 billion.

Phase 1 (Initial Operating Segment, or IOS) is now under construction. Construction began in 2001, and the first trains will be in revenue service in late 2004. The IOS will replace much of the current 15-Third motor coach route with surface LRT, operating mostly in semi-exclusive right-of-way except in the Bayview Commercial Core. This investment is justified because of heavy ridership in the corridor – it is currently served by articulated coaches and frequency is already high – and real and potential growth along the alignment, particularly in Mission Bay.

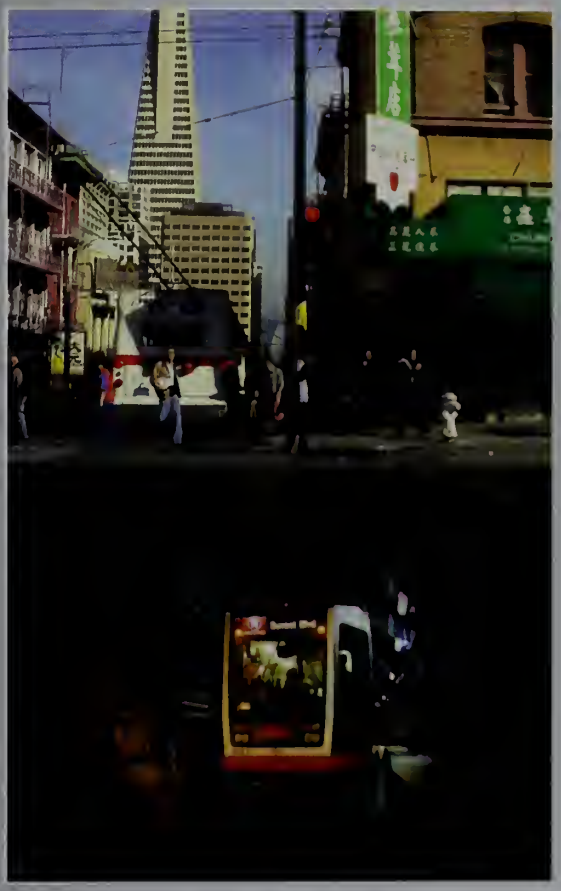
Initially, Third Street trains will operate on the Muni Metro Extension on The Embarcadero north of the Caltrain Terminal and into the Market Street subway. Along the route, the Third Street LRT project will vastly improve the street with landscaping, lighting, and other urban design treatments. The light rail line, with a projected ridership of over 92,000, is also a key component of the Redevelopment Agency's proposed programs and projects in this neighborhood.

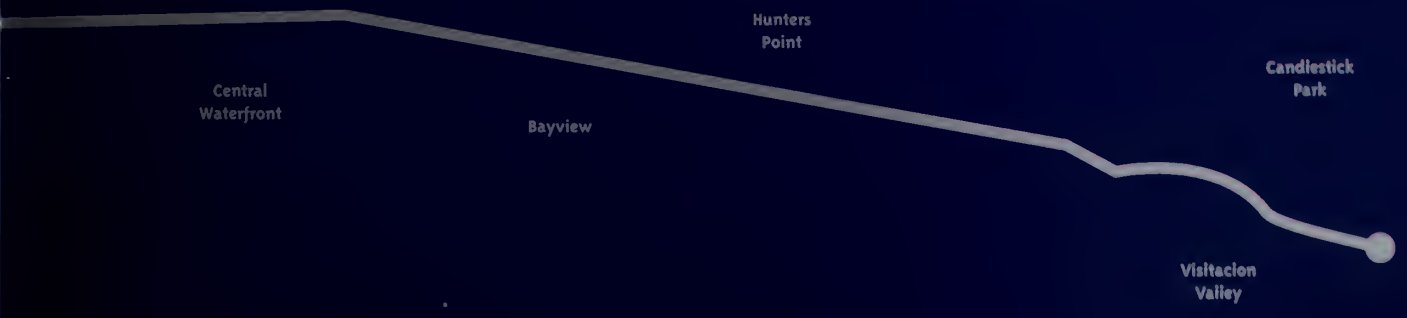
Initially, Third Street trains will operate on the Muni Metro Extension on The Embarcadero north of the Caltrain Terminal and into the Market Street subway.

Phase 2 (Central Subway) is the next major investment for Muni. The Central Subway will take Third Street trains from Fourth and King into a subway through SOMA, across Market Street, to Union Square and Chinatown, serving many destinations and connecting to BART. The Central Subway will build some of the prospective Geary line's downtown infrastructure. As such, it is essential to build the Central Subway as a precondition for Geary LRT.

In addition to providing much-needed capacity in the Chinatown area, the Central Subway will provide direct connections between SOMA, downtown and Chinatown and the southeast part of the city, Potrero Hill, and Mission Bay.

This project is listed in Track One of MTC's draft RTP, has received TCRP funding, and is currently in the federal New Starts process.





G E A R Y

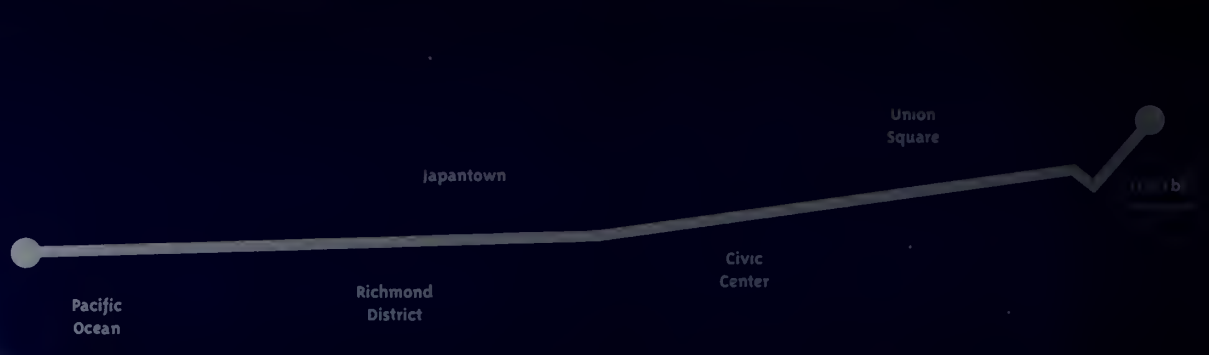
Geary, one of the most heavily traveled corridors in San Francisco, traverses the city from downtown through the Richmond District to the ocean. It includes Geary and Clement, both major commercial streets. Destinations along Geary include Kaiser medical facilities, UCSF's Laurel Heights campus, Japantown, and Union Square, the Financial District and the Transbay Terminal. The Richmond District is one of San Francisco's largest residential areas. The corridor is served by motor coach (38-Geary, 38-Limited, 2-Clement, peak hour expresses) and trolley coach (1-California, 31-Balboa, 5-Fulton).

Ridership numbers bear out the importance of the Geary corridor: the 38-Geary local line alone has one of the highest ridership numbers of all Muni lines (28,779 average weekday). The four Geary routes together carry 50,000 riders on an average weekday; taken together, the Richmond lines on Geary, Balboa and California account for 111,770 rides, nearly 16% of Muni's weekday ridership.

Despite the numerous lines that serve this corridor, capacity is still insufficient – during the peak, there are two express bus lines and a limited as well as local route. This effectively adds up to a bus every two minutes, but the buses are often crush-loaded. High ridership and capacity issues result in increased dwell times. The scheduled P.M. peak run time for the 38-Geary has increased 11% in ten years

The four Geary routes together carry 50,000 riders on an average weekday.

The Geary lines experience delays and reliability problems because of congestion in the downtown portion of the route, east of Van Ness and on Market. Diamond lanes on Geary and O'Farrell east of Van Ness need more vigilant enforcement, as they are used by non-transit vehicles and often blocked by double-parked vehicles. The city has built a number of bus bulbs in downtown (at Kearny, Stockton, etc.) which are improvements, but the corridor needs a major upgrade.



Muni envisions a surface/subway LRT line serving this corridor. Geary is in the Four Corridors Plan and has been the subject of many studies, including the original BART system plan. Muni conducted a Geary Corridor Planning study in 1995, which recommended moving forward to a Major Investment Study (MIS) and environmental review with three alternatives:

- Light Rail, all-surface configuration
- Light rail on the surface west of Laguna, in subway east of Laguna
- Trolley Coach on the surface west of Laguna, in subway east of Laguna

Muni's governing board at the time, the Public Transportation Commission (PTC), accepted the report and elected not to move forward until a viable financial plan could be developed. The PTC did not select a preferred mode and alignment.

Geary is next in priority for major investment after the Central Subway. The Central Subway is an essential first component of a Geary subway, since it will build portions of the Geary subway including junctions and stations. Muni staff recommends that Geary should be a surface light rail line from the ocean to Laguna, where there is enough width on the street for an exclusive transit ROW. The LRT would then go into a subway through downtown, connect with the Central Subway with transfers to the Market Street Subway, and terminate in the Financial District or SOMA. The Geary line could also include access to the Transbay Terminal. This new line would require a new LRT facility or a major expansion of Metro East to accommodate the additional vehicles needed to operate the new rail line.

Phase 1	
BRT from Pacific Ocean to Van Ness and TPS Transbay Terminal	$346.0M
Phase 2	
Subway/surface LRT from Pacific Ocean to Transbay Terminal	$1,340.9M
38 rail cars for Geary LRT	$133.0M
New rail facility	$200.0M
Phase 2 total estimated cost	**$1,673.9M**

Photomontage courtesy of David Vasquez.

A subway-surface light rail line on Geary would increase reliability, by ensuring that auto traffic would not impede transit vehicles, particularly in the most congested downtown portion of the corridor. Capacity would increase and travel time would decrease. Perhaps most importantly, the quality of service to riders would improve.

An intermediate phase for Geary would be BRT in a physically separated ROW, with major TPS improvements east of Van Ness. This would include timed signals and proof-of payment. Geary should be a priority line for a real-time passenger information system and other technology investments.

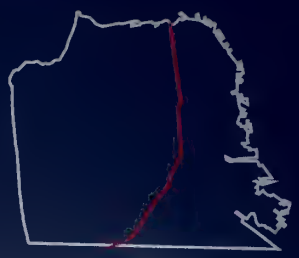
VAN NESS - MISSION

Both Van Ness and Mission are essential arteries. Both have many major destinations, such as Fort Mason, City Hall and Civic Center, Mission District and connections to BART, and both serve important residential neighborhoods and commercial districts. Van Ness is a designated state highway, and although it appears to be completely auto-oriented, the adjacent blocks have up to 100 housing units per net acre, among the highest residential densities in the United States. Mission Street itself is an important commercial street, surrounded by relatively dense, relatively low-income residential areas. As a result, there are a high percentage of transit-dependent residents and ridership is quite heavy along this corridor.

Muni operates several trolley coach and motor coach lines on Mission (14, 49, 67) and Van Ness (47, 49) for a total ridership of almost 100,000 daily riders. The Van Ness lines cross every east-west line in the northern half of the city; Van Ness is also used by Golden Gate Transit. During peak hours, the 14-Mission runs every five minutes and the 47 and 49 each run every seven minutes, so service is quite frequent. However, buses on Mission and Van Ness experience delays due to high levels of congestion, making reliability an issue. In the last ten years, scheduled PM peak run time has increased 20.4% and 4.3% on the 14-Mission and the 47-Van Ness respectively.

The Van Ness corridor has one of the highest residential densities in San Francisco.

Van Ness is one of the Four Corridors in the SFCTA plan, and Muni's vision is to have surface LRT in exclusive ROW on Van Ness. However, there is a substantial operational question of how this line would fit into the existing route network and how it would connect with other lines and maintenance facilities. If the LRT line were extended into the Mission, the project would have to resolve right-of-way issues along Mission Street, which is not as wide as Van Ness.



A rapid bus transitway is in the planning stages for Van Ness Avenue between approximately 12th Street and Lombard Street. The transitway could occupy the center of Van Ness Avenue and would separate buses from other traffic using raised medians, landscaping, and boarding platforms. Changes would be made to existing traffic lanes, medians and sidewalks. The boarding platforms on the Van Ness Transitway would also improve overall system accessibility. This option would require major TPS improvements along Mission Street, as Mission is not wide enough to allow the transitway concept to be built as it is currently envisioned for Van Ness.

Phase 1	Electrification	$25.1M
Phase 2	BRT on Van Ness and TPS on Mission	$434.7M
Phase 3	Surface LRT from North Point to Daly City BART	$905.8M

As a first step, the 47-Van Ness should be electrified at either end of the route, to the Caltrain terminal and to the northern terminal. This would allow all electric operation on Van Ness. In addition, the 14-Mission should be extended to serve Daly City BART.

Photomontage courtesy of David Vasquez.

CORRIDORS

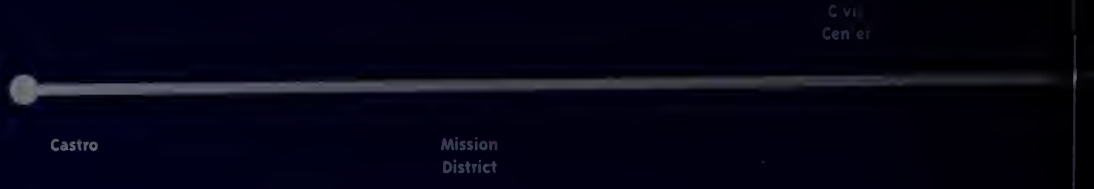
MARKET STREET

Market Street is San Francisco's spine, serving as the heart of the business and retail centers of the city, a regional and local transit hub, the symbolic focal point of the city, a key view corridor, a celebration space for major public events, and a growing residential district. It is a high density, fully built out corridor with many major destinations – The Embarcadero and Ferry Terminal, Financial District, Union Square, theater district and Civic Center; farther west are medium density neighborhood commercial and residential uses.

Market Street is extremely transit-rich – Muni Metro and BART run below grade and the F-Market streetcar line and numerous bus lines operate on the surface. All five Metro lines, the F, and six bus lines serve the segment between Van Ness and The Embarcadero, providing extremely frequent service. Muni recently began operating the Castro Shuttle, peak-period Metro service to relieve crowding between Castro and Embarcadero. Ridership on Muni is very high on Market; 16 lines (23% of Muni lines) travel on Market at some point, accounting for over a quarter of Muni's weekday ridership.

Funding will be in place shortly for a planning study of Market Street, led by a broad coalition of transit, bike and pedestrian advocates and city staff. The study's goals are to improve pedestrian safety, transit efficiency and access, and bicycle mobility, and to accommodate motor vehicles in a way that ensures Market Street's commercial and residential viability. In addition, the City Planning Department is working with the community around Market and Octavia to develop a plan, in particular for parcels that will become available when the freeway is demolished. There is a good opportunity for housing in this area because it is well-served by transit.

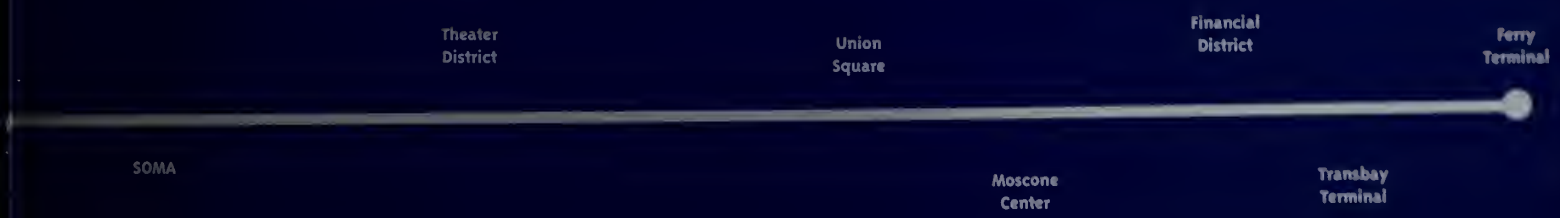
Auto congestion on Market results in reliability issues, particularly east of 5th Street. Pedestrians, bicyclists, delivery vehicles, taxis and private transit vehicles also compete for space on the street. The delays reverberate throughout the system, affecting reliability systemwide. Also, the eastbound F-line jogs to the right to avoid the Franklin left-turn lanes, creating a potential safety issue and reliability problems for the F-line.



The overall goal on Market is to reduce delays caused by autos. This can be done by diverting auto trips (without impacting Mission Street) and restoring transit-based signal timing. Transit on Market Street could operate most efficiently in a physically separated ROW, especially between Van Ness and the Embarcadero. However, there are significant questions of how this could occur on Market Street, given the volume of transit vehicles and the need to maintain access for other modes needs.

San Francisco's job center is at the geographic edge of the city and Market Street is its primary artery, so density of service will always be very high. Capacity increases can be achieved by enhancing rail service in the subway or adjusting bus routes. For instance, diverting a Richmond District line such as the 31-Balboa to the Caltrain terminal could offer wider choice of destinations from the Richmond and free up space on Market Street.

Phase 1	TPS treatments from Castro to The Embarcadero	$0.67M
Phase 2	BRT from Castro to The Embarcadero	$94.4M



CHINATOWN • NORTH BEACH • MARINA

North Beach and Chinatown are among the city's most densely populated neighborhoods, with an average of 90 units per net acre. Chinatown is one of the lowest income areas of San Francisco, and its residents tend to be transit-dependent. Throngs of tourists, who also often rely on transit, visit this area. This corridor connects residential areas in the northeastern portion of the city with Chinatown, Union Square, and parts of the Financial District.

This corridor is currently served primarily by several trolley coach lines – the 30-Stockton, 41-Union and 45-Stockton-Union, all with heavy ridership through this part of the route. The 9X, 9AX, 9BX, 15, and 30X lines also serve this area. Taken together, service is quite frequent. However, very narrow streets and high levels of automobile congestion make it very difficult for transit vehicles to maintain schedules. In the last ten years, the 15-Third running time has increased by one-quarter, and the running time for the 45-Union-Stockton has increased by 7.5%. For the same reasons, capacity is an issue – it is difficult to add more vehicles, or even to use articulated coaches instead of standard coaches on a street as crowded as Stockton.

Muni envisions extending the Central Subway further north from the planned terminal at Stockton and Clay in Chinatown, through North Beach and Fisherman's Wharf. It could come to the surface and extend into the Marina on a surface alignment via Lombard or Chestnut, with a terminal at the Presidio. The subway could be built to accommodate trolley coaches as well as light rail.

As a first step, this alignment needs the highest level of TPS treatments, including physically separated ROW for the 30 and 45 along the entire lengths of the routes, signal priority systems, and bus bulbs or boarding islands to speed boarding. Major parking and traffic controls are also needed throughout Chinatown and North Beach. This area also has several sidewalk width deficiencies for pedestrians, given the volume of people on the sidewalks. Some opportunities exist to pursue transit and pedestrian improvements in tandem.

Phase 1	TPS treatments from Stockton/Market to the Presidio	$112.8M
Phase 2	Surface LRT from Marina Green to Third Street	$553.6M

FILLMORE • 16TH STREET

Fillmore-16th Street, currently served by the 22-Fillmore, is a major crosstown route carrying almost 25,000 riders each weekday. It serves the Fillmore commercial district and the residential neighborhoods of Pacific Heights, Western Addition, Mission and Potrero. It also provides connections to Market Street, BART and most Muni radial routes. It runs every eight minutes during the day with six-minute headways during the PM peak, and owl service between 1AM and 5AM. This route is the first bus line to be equipped with a real-time passenger information system, which informs passengers at selected bus stops when the next two buses are expected to arrive. This has been successful and Muni is seeking funding to implement it throughout the network.

Buses experience more delays on the Fillmore section of this route because it has the highest ridership on the line, and only one lane in each direction, where parking and turning movements block transit vehicles. The 22-Fillmore will be rerouted during the development of Mission Bay to continue east on 16th Street to Third Street, rather than turning south to Potrero Hill..

Ultimately, this could be a surface light rail corridor with connections to the N, J, Market Street, and Third Street.

In the near term, a BRT-type service could be developed on 16th Street, where there is sufficient street width to accommodate an exclusive lane for buses, along with significant TPS improvements on Fillmore, including signal priority, bus bulbs and prohibition of left turns at key intersections.

Phase 1	TPS on Fillmore and BRT on 16th Street, including electrification on 16th	$87.5M
Phase 2	Surface LRT from Marina Green to Third Street	$642.8M

GENEVA • OCEAN

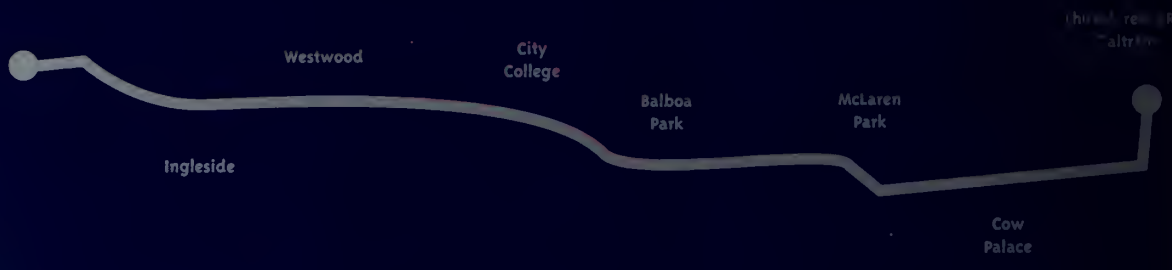
The Geneva-Ocean corridor passes through relatively low density residential neighborhoods and a number of small commercial districts, but this area is anticipated to see some changes. The Baylands in Brisbane will be developed; Visitacion Valley residents have initiated a planning process; and the Better Neighborhoods plan, a cooperative planning effort led by City Planning that includes Muni, BART and the community, could result in added residential density around Balboa Park, a revitalized Ocean Avenue commercial corridor, and possible development on the site of the Balboa reservoir near City College.

Ocean Avenue from Junipero Serra to San Jose is currently served by the K-Ingleside in mixed-flow ROW. Geneva is served by the 15-Third, 9-San Bruno, and 9X-San Bruno Express, all articulated motor coach lines. The K-line experiences delays on Ocean Avenue because of conflicts with automobiles and turning movements. Scheduled run time on the K-line has risen by 20% in the last ten years. Ridership on these lines is fairly high. Although crush loads do not usually occur in this corridor, reliability and operating speed on this portion of the route is essential to maintaining service on the entire route.

This corridor would be best served by surface light rail in exclusive ROW. The K-line would continue to operate on Ocean and an extension of the Third Street LRT would operate on Geneva with a terminal at Balboa Park BART or Phelan Loop.

An interim step on Geneva would be to implement significant TPS measures such as stop respacing and signalizing all-way stop intersections. The interim step will also include establishing exclusive ROW for the K-line on Ocean Avenue.

Phase 1	TPS treatments from Junipero Serra to Bayshore/ Sunnydale, including exclusive ROW for K	$50.7M
Phase 2	Surface LRT from Bayshore/Sunnydale to Balboa Park BART	$148.6M



19TH AVENUE • PARK PRESIDIO

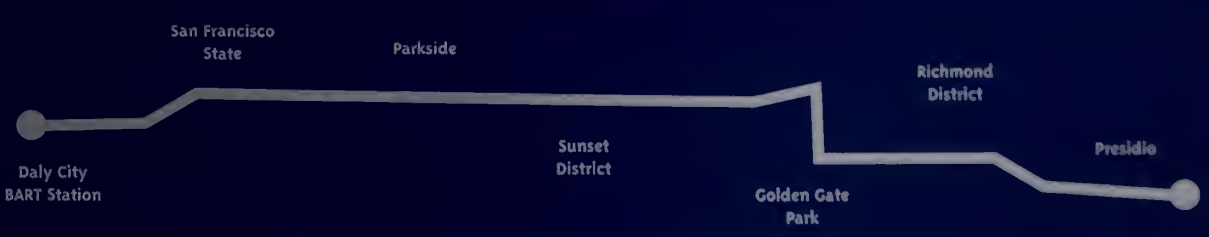
19th Avenue is the primary north-south artery in the western half of the city. It is designated a state highway and carries large numbers of autos. Many of them travel through the city from Marin to the peninsula, but it also serves key destinations in San Francisco: the Presidio, Golden Gate Park, Stern Grove, San Francisco State University and Stonestown Mall. Nearby residential areas are generally low-density. The corridor is served by the 28-19th Avenue and the 28-Limited, with 12-minute headways and a combined ridership of approximately 15,000 riders per day. The 29-Sunset runs parallel on Sunset Boulevard.

This corridor is heavily congested, and buses must operate in regular traffic without a diamond lane or any other transit priority measures. The M-Ocean View runs in an exclusive median between Eucalyptus and Junipero Serra, but effective grade crossing protection is needed for the M-line as it crosses 19th Avenue at Eucalyptus.

19th Avenue is appropriate for surface LRT. The alignment would follow the existing 28 route, with a potential extension south to the airport. Exclusive rail ROW already exists between Eucalyptus and Junipero Serra.

A more immediate improvement for this corridor is BRT with exclusive ROW, possibly extending to SFO. This line could be operated with suburban-style coaches.

Phase 1	BRT from Golden Gate Bridge to Daly City BART	$239.1M
Phase 2	Surface LRT from Golden Gate Bridge to Daly City BART	$432.7M



POTRERO • SAN BRUNO

Potrero and San Bruno form a north-south corridor between Mission and Third Street, running from SOMA and meeting the Third Street LRT at Bayshore. This corridor includes a number of residential neighborhoods as well as many commercial and industrial employment clusters. The 9-San Bruno serves the length of this corridor, supplemented by the 9X, 9AX, and 9BX express lines. These lines combined carry 38,000 riders per weekday.

This corridor includes a number of residential neighborhoods as well as many commercial and industrial employment clusters.

San Bruno is very narrow, with only one lane in each direction, resulting in congestion problems for transit.

BRT is appropriate for Potrero Avenue but because of San Bruno's limited width, that part of the corridor requires significant TPS treatments.

A first phase would be electrification of the 9-San Bruno, since almost half of the route is already under wire.

Phase 1	Electrification of 9-San Bruno	$56.1M
Phase 2	BRT on Potrero and TPS on San Bruno	$41.9M

THE EMBARCADERO

Since the demolition of The Embarcadero Freeway, this corridor has enjoyed a renaissance as one of San Francisco's most beautiful boulevards. It serves a number of major destinations, such as Fisherman's Wharf, the Ferry Terminal, Pacific Bell Park and the Caltrain Terminal. In addition, the Port of San Francisco is planning and developing a number of projects on the piers, including office and entertainment uses and a cruise ship terminal. The corridor also has a growing residential presence. The Embarcadero is an attraction in itself, and many tourists take the F-Market simply to enjoy the ride.

Transit service on The Embarcadero enjoys almost continuous exclusive ROW, but there are improvements to be made, primarily in providing more complete service along the entire corridor. As part of the F-line extension to Fisherman's Wharf, connecting tracks were built on The Embarcadero between the F tracks north of Mission and the MMX tracks south of Folsom. These tracks give Muni the ability to operate rail service along the entire waterfront from Fisherman's Wharf to Fourth and King streets, but operational and systemic constraints currently prevent the implementation of service.

Muni's vision for The Embarcadero is to extend light rail service along the northern edge, from Fisherman's Wharf to Fort Mason and the Presidio through the Fort Mason tunnel. This could be an extension of the North Beach-Marina light rail line or the F-Market historic streetcar.

A short-term project is implementation of E-line service, continuous rail service from Caltrain to Fisherman's Wharf along The Embarcadero. In order to operate the E-line, a number of issues must be resolved, such as sufficient maintenance capacity, procurement of an adequate number of historic vehicles, and operating and capital funding. The primary capital cost is for design and construction of terminal improvements on the southern end.

Phase 1	E-line terminal loop	$11.3M
Phase 2	LRT from Fisherman's Wharf to the Presidio	$111.0M

S O M A

The South of Market area (SOMA) developed rapidly in the past decade, and is anticipated to see further development. The Yerba Buena redevelopment project – including the Moscone Convention Center and its expansion, the Museum of Modern Art, Metreon complex, and Yerba Buena Gardens – is nearly complete. Many new offices and live/work buildings exist now next to the industrial buildings that used to dominate the area. Many new restaurants, nightclubs and entertainment facilities accompanied this development, including the new Giants ballpark. The Transbay Terminal is expected to be rebuilt and the new Federal Building at Mission and Seventh will start construction soon.

Muni recently implemented major changes to improve SOMA service. At least nine Muni routes pass through SOMA in all directions, and east-west streets are useful as Market by-pass routes. Although SOMA's wide streets are generally good for transit, freeway ramps disturb traffic flow and the industrial uses that remain require heavy truck traffic and loading areas. In addition, most streets are one-way, complicating bus routing for riders. The growth in traffic and congestion is illustrated by the fact that scheduled run times for the 12-Folsom and the 27-Bryant increased by a quarter in ten years (27% for the 12 in AM peak before the route changes, 23% for the 27 in PM peak).

A clear trunk line for SOMA would improve service for passengers in this corridor. Folsom Street is the logical route, since it is midway between Market and King Street, and it should allow two-way BRT operation. This would protect transit vehicles from added congestion. The Department of City Planning is also considering the possibility of converting Folsom to a two-way street. Folsom can thus be transformed into a transit and pedestrian street, rather than an auto-dominated street.

Phase 1	BRT from The Embarcadero to 16th Street	$70 9M

HUNTERS POINT

Bayview Hunters Point is now seeing a large transit investment with the Third Street LRT Project. In the coming years, Muni expects additional need for transit investment due to anticipated development in the Hunters Point Naval Shipyard. The former Navy shipyard is the last major development site in San Francisco, and plans are underway for its transformation into a commercial and entertainment center. The proposed development program for the first ten years includes 1,514 housing units and 3,550 jobs, which could generate up to 10,000 trips per day.

The area is currently served during the day (7AM until 6PM) by the 19-Polk, which winds its way through Potrero Hill to the shipyard via Evans and Innes. There is no service at night. Any growth in the shipyard would require additional service – the details of such service would depend on the type and scale of development.

When the shipyard and neighboring areas are developed, this corridor would be best served by BRT in the Evans/Innes corridor, possibly connecting to Cesar Chavez and the 24th Street BART station or to Civic Center. This would allow connections to the Third Street LRT, the Potrero-San Bruno BRT line, and Mission Street.

Depending on the timing of new development, the 19-Polk could become a major trunk line with TPS treatments, rerouted to be more frequent and more direct to the Civic Center area. The 19-Polk could be also converted to electric trolley coach operation in the short term.

Phase 1	TPS on 19-Polk route	$3.6M
Phase 2	Electrification of 19-Polk	$118.8M
Phase 3	BRT from Innes/Donohue to Cesar Chavez/Mission	$129.7M

EXISTING RAIL

N-JUDAH • TARAVAL • CHURCH • OCEAN VIEW • INGLESIDE

The majority of Muni's existing rail service is on surface streets in mixed flow, in corridors with low to medium density housing and neighborhood commercial districts. Although traffic is not as heavy as in downtown, many of these routes have all-way stop signs that add running time, as well as turning movements and parking regulations that interfere with transit movement. Rail vehicles are particularly prone to delays due to automobile interference, since they cannot maneuver around obstacles. All five Metro rail lines have seen increases in scheduled running time in the last ten years, even as ridership has grown in the rail system.

These routes have the highest ridership numbers in the system and require special treatment to improve service for passengers and to take advantage of the substantial investment in rail. For ten blocks between 9th and 19th avenues, the N-Judah operates in a physically separated ROW which prevents autos from interfering with rail operations, but easily allows cross traffic at intersections and emergency access. This is a good solution that could be replicated throughout much of the system.

All rail corridors should be protected with exclusive ROW and other TPS treatments: boarding islands at all stops, conversion of all-way stops to signalized intersections with priority for transit, and signal priority or grade crossing protection for the M-line to cross 19th Avenue at Eucalyptus. Ultimately, the M-line could be grade-separated from St. Francis Circle to 19th and Junipero Serra.

The N-Judah runs on the surface for half a mile between the Market Street subway and the Sunset Tunnel. Not only does it mix with traffic in that segment, the train must slow down to emerge from one portal and re-enter the next one. Building a subway for this stretch of the N-line would greatly improve its reliability and shorten its travel time noticeably.

TPS Treatments	
J (Duboce Portal to 30th Street)	$0.5M
K (St. Francis Circle to Green Terminal)	$0.5M
L (West Portal to Wawona/46th Avenue)	$1.2M
M (St. Francis Circle to Green Terminal)	$1.6M
N (Duboce Portal to La Playa)	$0.7M
Subway for N-Judah on Duboce	$182.7M

NEXT STEPS

Muni staff recommends moving towards implementation of Geary BRT and Van Ness BRT as a first step. These will provide the maximum benefit to the maximum number of passengers and allow Muni to start moving forward with significant steps for rapid transit in San Francisco.

This document provides a long-term vision of an enhanced Muni system, taking into account foreseeable changes in the city and the Bay Area. All of these capital improvements are appropriate and consistent with projected growth and development in the city, but clearly, they cannot all be built at once. This document provides a reasonable approach to prioritizing them and is presented as a first step in implementation. The next step is to identify sources of funding, a process that requires public support and coordination among Muni, elected officials, the business community, and advocacy organizations.

Projects suggested in this document will pass through the normal processes both within Muni and in the city. They will be added to Muni's Capital Improvement Program and the Short-Range Transit Plan in order of priority vis-à-vis Muni's other capital needs and as funding is identified. Equally importantly, the SFCTA must evaluate the projects and include them in the Countywide Transportation Plan.

San Francisco should be bold in moving toward a transit system that offers greatly expanded capacity, reliability, system efficiency, and upgraded quality of service for passengers and even better quality of life for San Franciscans.

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